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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	**David S. Sumida et al.**	Examiner:	Sung H. Pak
Serial No.:	**09/894,347**	Art Unit:	2874
Filed:	June 28, 2001	Our Ref:	B-4034 618348-2
For:	"GUIDED MODE LASER APPARATUS WITH IMPROVED CLADDING STRUCTURE AND A METHOD OF FABRICATING THEREOF"	Date:	June 28, 2004
		Re:	***Amendment and Response***

DECLARATION UNDER 37 C.F.R. §1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, Hans W. Bruesselbach, declare and say:

1. I am one of the co-inventors in the above-identified application.

2. I graduated in 1972 from the University of California at Los Angeles and received a Master of Science degree in the field of Physics.

3. I have been working in the field of lasers since about 1974. I have spent the past twenty years principally in research and development of nonlinear optics encompassing crystal laser systems and fiber lasers. I have directed programs that brought Yb:YAG lasers from the milliwatt to the kilowatt regime, and helped develop diffusion bonded composite crystals that are key to this scaling.

4. I am a co-inventor of nineteen issued U. S. patents. I have co-authored ten technical papers in this field and have given talks on the subject at over thirty conferences.

5. I am familiar with the above-identified application, U.S. Patent No. 5,852,622 (the '622 patent), and U.S. Patent No. 6,288,833 (the '833 patent) and have read the Office Actions of June 19, 2003 and March 3, 2004.

6. I respectfully submit that the Examiner has overestimated the predictability of the art and the amount of experimentation required to identify materials that are well suited to being combined with one other to form solid state laser waveguided structures.

7. Lasers formed with diffusion-bonded composite crystal structures have been known for over a decade, and there is a considerable body of literature in the field. I and the co-inventors have personally contributed to this literature. As any one of ordinary skill in this field knows, only certain crystals can be bonded to one another and thus crystals for forming a laser waveguided structure cannot be selected arbitrarily but rather by studying the thermal expansion coefficients (CTE) and other physical properties of the crystals and by conducting physical experiments on actual prototypes. This lack of predictability in the art is evidenced by the more recent patents that have issued in the field and that do not attempt to cover each and every permutation of diffusion bonding but rather are directed to specific structures embodying specific combinations of materials. Our invention is similarly focused to a specific combination of materials that we have found through experimentation to provide a crystal structure that solves parasitic oscillations and other problems and that may be easily fabricated via diffusion bonding.

8. Because diffusion bonding may only be practiced on certain, specific combinations of materials, one skilled in the art would never assume that a combination of materials used in a specific embodiment of one patent may be used to practice the invention described in another patent. This is equally true of the structures described in the '622 and '833 patents.

9. The '622 patent discloses in Figure 6 a structure that appears to be similar to the invention claimed in our application. However, a review of the '622 disclosure reveals several significant differences between the structures described therein and our claimed invention. With respect to Figure 6, the structure shown does not appear to be specifically

designed to be a waveguiding structure (albeit some weak, inadvertent guiding will likely occur due to the difference in refractive index between the doped central region and the undoped cladding), and there is no discussion nor reference to it as being a waveguide structure. This reading is further supported by the reference to "improved beam quality" at column 9, line 8, because achieving high beam quality in this structure requires that any difference in refractive index between the cladding and the core be small to thereby minimize optical aberrations that would otherwise distort the laser beam.

10. It is true that the '622 patent does state that "the refractive index of the laser-active medium may be the same or higher than the laser-inactive medium" (col. 3, l. 38) but this statement is directed to the embodiments of figures 2, 3 and 4, which are the only structures that are specifically referred to as being waveguiding structures. These waveguiding structures are all shown to have a guiding layer on only one or two sides of the core, which is entirely different from our claimed structure. I wish to note that it is well known in the art that to date no attempt to encase a laser-active crystal with Sapphire on all six sides has succeeded, and surrounding a laser-active crystal with Sapphire on four sides has been accomplished but with considerable difficulty.

11. In contrast to the '622 and '833 patents, our claimed structure is specifically designed to be an optimized composite-crystal guiding structure that is not guided in only one plane and that, due to the guiding on all sides, further minimizes parasitic oscillations. We accomplish this by specifically selecting doped LuAG as the material for the core and YAG for the cladding, which are two materials that have sufficient difference between their refractive indices but sufficiently similar thermal expansion coefficients and crystalline structure to permit diffusion bonding. These materials allow us to clad the core on all sides. The '622 patent provides the structure of figure 7 as an embodiment directed to minimizing losses due to parasitic oscillations. The embodiments of the '833 patent are all formed on a substrate with cladding on only two sides. Our claimed structure does not require a substrate, and the specific material combination that we claim allows the cladding to surround the core completely.

12. One of skill in the art reading the '833 patent would only learn that LuAG can be used as the core material in a multi-layer structure with a single-mode core waveguide and multimode waveguides disposed on opposite sides of the single-mode waveguide, all of which reside on a substrate. Our structure is much simpler and very different, as it has no substrate and a single, multi-mode waveguide. In essence, our invention teaches a new, easier way of making devices where the core is clad on all six sides. Our new, claimed way is different from the way of making the embodiment of figure 6 as described in the '622 patent – the only embodiment in either of the two patents that is superficially similar to our structure. One skilled in the art reading the '833 patent would never presume that LuAG could be used as the core material for the embodiment of figure 6 in the '622 patent (which is not disclosed to be a waveguiding structure in the first place), nor that LuAG would be used together with a YAG cladding (which is a combination that is not mentioned anywhere in the '833 nor the '622 patent), nor that LuAG and YAG could be joined by the process of diffusion bonding. The person skilled in the art knows full well that unless specifically so disclosed, no combination of materials being combined by any process can be presumed to be feasible without detailed knowledge of the materials' properties or until experimentally proven.

13. For all of the above reasons I respectfully submit to the Examiner that one skilled in the art would not find our claimed invention obvious and would not even consider making our invention solely because of reading the '622 and '833 patents, and would know that any combination of specific materials joined with a specific process that is not specifically disclosed in the art cannot even be presumed possible.

14. I declare further that all statements made herein of my own knowledge are true; that all statements made herein on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patents issuing thereon.

Date: 7-1-'04

Hans W. Bruesselbach